English Summary[1]

Lute Making in Southern India

M. Palaniappan Achari and His Work

A. Points of Departure

The decisive impulse to start on the following work developed out of the scientific cataloguing of stringed instruments from South Asia and South East Asia in the Berlin *Museum für Völkerkunde*, part of the Berlin State Museums and Prussian Cultural Heritage. The resulting project in the Department of Ethnomusicology was carried out between 1987 and 1990 under the supervision of Prof. Dr. Artur Simon.

An investigation into the specialised and interdisciplinary area of instrument-building requires specific background knowledge. Here I was able to draw on many years of experience in building, repairing and restoring stringed instruments. In the course of an earlier work on the making of musical instruments by non-professionals in the Federal Republic of Germany,[2] I had been able to develop and try out the methodology.

The intensive occupation with authentic musical instruments in scientific and practical terms led to pinpointing the problems and to the precise formulation of questions. In order to reach a correct evaluation of the sources, it was judged necessary to acquire more exact knowledge about construction of the instruments and the original uses to which they were put.

Parameters and Method

It was decided to pursue the above-mentioned questions concerning the building of stringed instruments taking a region of South Asia as an example. Southern India was chosen as the area of investigation. While various scientific publications on carnatic music itself do exist, there has been extremely little work until now on the construction of Southern Indian musical instruments.[3] The Department of Ethnomusicology had good contacts to traditional musicians and to musicologists in Southern India before the study began. Dr. K.S. Subramanian, Reader in Music at the University of Madras, put himself forward as academic supervisor for the work in India. A grant from the Indian government and support from the German Academic Exchange Service (DAAD) financed a research trip to the state of Tamil Nadu from February to June 1993. In order to respond to a vīṇā maker's offer of comprehensive cooperation, it was decided to set a narrow regional limitation on the object of research while at the same time broadening and deepening the subject matter. Work observed in the workshops was documented by photo-

1 Translation of the English Summary and the photo titles: Rosee Riggs.
2 Unpublished degree dissertation, Free University of Berlin: Beyer 1979.
3 Only in 1990 did Daniel Bertrand treat the basic principles of building vīṇā instruments within the scope of his degree dissertation at the University of Sorbonne/Paris: Bertrand 1990.

graphs, written notes, sketches and technical drawings; in addition, acoustic samples were recorded digitally on tape.

In systematic terms, this way of working is classed as 'participant observation',[4] whereby its inherent contradictions and specific problems revealed themselves particularly clearly: During especially intensive phases of participation, some forms of observation are per force left out. Thus there are no photographs of certain steps of the work on the *cinna vīṇā* which was produced as a teaching and learning example, because these activities were carried out by myself. In terms of the declared aim of an emic approach to the object, this 'lack' of complete documentation was compensated for by a growth in 'experience' or even 'insight'.[5]

The structure of the work in hand is determined by its representing a single case. The central theme is a man and his work: M. Palaniappan Achari from Tiruchirappalli in the Indian state of Tamil Nadu. Consequently, the book begins with details about the person, his family, his workshop and environment followed by descriptions of his products and working methods. After the application of materials and tools and the working processes accompanying them comes an investigation into forms of distribution and future users of the instruments. The conclusion comprises observations about ways in which techniques of playing and other user-specific aspects affect the construction, shape and production of the stringed instruments and influence the work of the vīṇā maker.

A significant amount of space has been allocated to a comprehensive representation of the production of a type of instrument in which shell, neck and peg box are carved from a single block of wood. In Southern Indian instrument-making, this single-piece *onno vīṇā* is the basis for all other forms of construction.

B. Concepts

Sarasvatī Vīṇā

The concept 'vīṇā' appears in ancient Indian Vedic scripts as far back as 1000 B.C. Like the instrument itself, the concept and its use were transformed in the course of history.

It remains unknown until this day when a bowl lute was first strung in Southern India in the manner of the North Indian stick zither, *bīṇ*. Tradition ascribes the invention of carnatic *vīṇā* to Prince Raghunātha Naik (1600–1643) and his minister, Govinda Dīkṣitar, in Thanjavur. At any rate, the major characteristics of the instrument were established by the first half of the 17th century. Sarasvatī, goddess of music and learning, is always represented carrying a vīṇā as her indispensable attribute. For this reason, the instrument is also often known as *Sarasvatī vīṇā*.

The long-necked lute is the most highly respected stringed instrument in Southern India. It was used in court music and in the temple, as a solo instrument as well as an accompaniment to vocal music. Without being over-dominant, the sound of the vīṇā can merge with the human voice which is regarded as the primary means of musical expression. In Southern India, the vīṇā is designated by musicians and theoreticians alike as the only instrument combining all the basic elements of carnatic music, namely melody, drone and rhythmical structure (*rāgam, svāram* and *tālam*).

Instruments of the type known as 'carnatic vīṇā' are heavy, long-necked lutes, over 1.30 metres long and weighing up to 6 kilograms, whose constituent parts are carved out of solid wood. Vīṇās made by Palaniappan are built in the following manner:

The body shell *(kuḍam)* (cf. Fig. 17 on p. 51) is a deep, rounded shape, bordered by circular lines and tapering at the upper end into the base of the neck. On the outside, inlaid, profiled strips form a pattern suggesting a rib-and-shoulder construction. The base of the neck continues with the hollowed-out part of the neck *(daṇḍi)*. The slightly convex soundboard *(mēlpalakai)* (02/18, cf. Fig. 121 on p. 215) is glued on to the bowl of the body shell and, for reasons of sound quality, should have a straight and regular grain. The trough of the neck is covered by a thin board *(mēlam sakai)* upon which two slender, raised ledges *(gādi sakai)* are fixed, which will later carry the frets embedded in wax. At the top of the neck sits the peg box *(vallāu)* (01/17, cf. Fig. 23 on p. 55) which curves backwards and ends in the head of a mythical animal *(yāli)*.

The vīṇā has four main strings running over the row of 24 chromatic frets *(mēlam)* and tightened with pegs *(bṛdai)* positioned at the side. Halfway down the soundboard, they go over a high bridge *(kuḍerai)* (cf. Fig. 24 on p. 56) which has an arched bridge-plate made of bell metal *(vengalam)* (15/11, cf. Fig. 25 on p. 57). On the left side of the neck, three more pegs are fastened from which three shorter drone and punctuation strings *(mupal)* run alongside the row of frets. They have their own side bridge, held in place by their tension and which leans against the main bridge.

All the edges of the vīṇā are given broad plastic inlays or covers with an engraved, coloured pattern (03/19, cf. Fig. 106 on p. 183). They protect the instrument from mechanical and climatic influences. In addition, the soundboard receives two symmetrical decorations known as "eyes" *(kan)* (cf. Fig. 27 on p. 59) as well as a small, round soundhole (16/13, cf. Fig. 123 on p. 218). Using a screw bolt, an additional removable resonator *(svarakai)* (cf. Fig. 26 on p. 58), made out of plastic, papier mâché or metal is mounted on the back of the vīṇā's neck. Its main purpose is to support the instrument while it is being played or while at rest, contributing to enrichment of the sound and fulfilling aesthetic functions.

Tambūrā

Besides the vīṇā and the violin, there is one more important stringed instrument in classical Southern Indian music: the four-stringed, fretless, long-necked lute, tambūrā, which is used as drone accompaniment. The tambūrā is played in a vertical position by plucking the empty strings gently with the fingers of the right hand in a fixed order. The convex surface of the bridge makes for an extremely lively sound spectrum which may furthermore be adjusted by positioning a thread *(jīva)* under each string. The name and shape of the drone instrument, tambūrā, indicates a heritage outside India. Long-necked lutes from the Arabian-Persian world like the *ṭanbūr* or from Central Asia like the Usbeki *dutār* may have been possible ancestors. The classical drone lutes of Southern Indian carnatic music have a rounded form, a carved wooden body shell with a raised stripe pattern and a slightly convex soundboard as well as a fitted, hollow neck without frets.

C. The Person, His Workshop and Profession

Biography

The *veena maker,* M. Palaniappan Achari was, according to him, 75 years old in 1993. He comes from the small village of Tekkerajavidi near Thanjavur. His father, Mariappan Achari, was a carpenter by profession, working in construction and building furniture. His father, Namaswaya Achari, Palaniappan's grandfather, was a *nāyanam maker,* that is a maker of the Southern Indian double reed instrument called the *nāgasvaram*.

Palaniappan first started work at the age of 12 and began his training at 14. He related several times with great satisfaction how a barber's apprenticeship had been planned at first. This, however, cost a not insignificant amount of money. His first teacher, the *veena maker,* K.Mahadevan Achari, took him on as an apprentice for free and there he stayed for four years. The second teacher Palaniappan had was Soma Achari in Thanjavur. Palaniappan regards this vīṇā builder as his real *guru* (revered master), from whom he

4 Atteslander 1975:150.

5 Simon 1979:36, 37. For the described feedback process, Simon coins the appropriate word *Ethnohermeneutik*.

learnt the most and with whom he remained for ten years. Palaniappan has a framed photograph of this master (26/08, cf. Fig. 3 on p. 18) hanging on the back wall of his workshop and he has also kept to this day a dragon's head carved by his hand (26/09). Palaniappan's third and last teacher for about three years was R. Govindasamy in Srirangam (20/29; 20/31).

M. Palaniappan then worked for 27 years as a mastercraftsman in Tiruchirappalli (Trichy) with the large firm of musical instrument producers, *Ramjee & Co.* Here he was able to use his acquired skills and train younger craftsmen. His wife, Nallammal Mahalakṣmī, and his brothers, Suppan and Ganeshan, were also working there at that time as *veena workers.* Due to differences of opinion, 1982 saw a parting of the ways and M. Palaniappan set himself up in business in Tiruchirappalli. In the course of his professional life, Master Palaniappan has worked for many well-known musicians like Trivandrum Subbulakshmi Ammal or Dr. S. Balachander. In recognition of his life's work and his contribution to upholding tradition, he was honoured with a ceremony in Madras on the 25th April 1993 (CD: Klangbeispiel 1).[6]

Workshop

In 1983, M. Palaniappan founded his own workshop (cf. Fig. 9 on p. 31) in Venice Street Nr. 71 C (cf. Fig. 10 on p. 32), Cinthāmani, Tiruchirappalli (19/31, cf. Fig. 11 on p. 33), after having bought a house there some time previously. The house (cf. Fig. 5 on p. 21) is fairly modern and has 3 large rooms: a workshop, a kitchen with adjoining room and an upper room (26/32, cf. Fig. 6 on p. 23; 26/33). The house has a veranda, a corridor and a backyard as well as its own water supply and sanitation. The ground floor is mostly used for working but all rooms, with the exception of the kitchen area, may be used to store materials or instruments.

In the summer of 1993, his wife, Nallammal[7] (05/25, cf. Fig. 8 on p. 25), daughter Sarsa, son Natarajan (11/0, cf. Fig. 7 on p. 24), and granddaughter Mariammar (03/05) all lived together with Mastercraftsman Palaniappan. From time to time, his grandson, Karthikayan (08/05) and further guests lived there as well. Naterajan, who is an officially approved *veena maker*, took part regularly in work for the firm. There is no fixed division of labour between father and son. Due to failing eyesight, Palaniappan got him in for certain finishing and checking phases of the work. Selvam, another son, lives elsewhere and is married with two daughters. Selvam only occasionally helped out with instrument building but he is able to carry out all essential tasks on his own. The planning and allocation of specific jobs are definitely Palaniappan's responsiblity (06/25, cf. Fig. 31 on p. 65). Generally, the workshop routine runs like clockwork.

When craftsmen come in from outside to work for Palaniappan, they naturally live and eat in his house. The vīṇā maker, C. Sundaraj from Thanjavur (cf. Fig. 13 on p. 37), spent several days there in 1993, chiefly to carry out paid work but partly also as a helping guest.

Product Range

M. Palaniappan lays emphasis these days on different sorts of the stringed instruments vīṇā and tambūrā (cf. Fig. 14 on p. 45; 17/05, cf. Colour Plate II). The lute known as *Goṭṭuvadyam* which is fretless and played with a wooden cylinder, is less called for nowadays and these he produces together with his business friend G. Venkatesan (cf. Fig. 4 on p. 19)). M. Palaniappan has been commissioned to produce many an experimental vīṇā

6 The well-known vīṇā-player, Doraiswami Iyengar from Mysore, dedicated a *tillānā* composition of Mysore Vina Seshana's (1852–1926) to him at the concert afterwards. This piece of music and an exact description of the ceremony held in his honour are to be found in the publication: *Meyer, A. (Editor):* Klangfarben der Kulturen – Musik aus 17 Ländern der Erde, Berlin 1998 (Nr. 17/p. 30).
7 Mrs. Nallammal Mahalakṣmī died on 30th July 1993.

instrument (cf. Fig. 15 on p. 47). The innovations can be grouped in themes like "ease of maintenance", and "improvements in playing and transportability".

A significant part of the firm's activities is dedicated to repairs and maintenance on existing instruments. The most important repair job in terms of the scope and number of commissions as well as of its importance to musicians must be defined as the remaking of the row of frets, *mēlam.* In Southern India, the life of the *mēlam* of an instrument in use is said to be three years, less if it is played often. Further repair work is undertaken on bridges, nuts and pegs and there is also glueing and lacquering. The sale and mounting of parts mainly concern a self-developed fine-tuning tailpiece and modern neck resonators (19/16, cf. Fig. 16 on p. 49).

D. Materials

Wood

As in the western world, wood is used in Southern India as the basic material for all stringed instruments. Because it is preferable to work monoxylically from solid wood, blocks of considerable dimensions are required.

In Tamil Nadu, the wood of the jackfruit tree, (*Artocarpus hirsuta* Lamk. resp. *Artocarpus integrifolia* L.) is traditionally used. It is called *pilamaram* or *jackwood.* The wood is very hard and durable, of medium weight and a glowing yellow colour when newly worked. It does not need to be sealed with lacquer and is not sensitive to climate changes as it contains a sap similar to latex.

Mastercraftsman Palaniappan has completely given up using *jackwood.* Departing from tradition, he uses *red cedar, Toona ciliata* M. Roem., Fam. *Meliaceae* instead. This material is lighter, good to work on and rich in sound but it does have to be lacquered. Palaniappan acquires this wood, which is also known as *sāntana vēmpu,* in quantity from the neighbouring federal state of Kerala. Before it is used, the wood is stored as pieces, blocks and beams beside the house and dried for at least three months. Good instrument wood should be as free as possible of splits, branches and other blemishes and the grain should be "straight and parallel" *(nēr).* According to these criteria, Palaniappan chooses the soundboard wood particularly carefully, as it determines the sound of the instrument.

Other types of wood are used in comparatively small quantities, but should be mentioned here briefly: The heavy, dense and finely structured *aca vairam* (*Hardwickia binata* Roxb., Fam. *Caesalpiniaceae*), whose colour ranges from pink to medium brown, is used especially for bridges, from which it gets its name *"tambūrā-bridge wood."*

Occasionally, Palaniappan takes for similar use a wood of the palisander sort, *Dalbergia latifolia* Roxb., *Papilionaceae.* He calls it *rosewood* or *īti*, although he draws attention to the fact that in Madras it is usually called *nōkai.* Once he actually made a whole vīṇā out of it but the price of the wood is very high these days.

A substitute for *red cedar* for parts of lesser importance is *silver oak,* (*Barringtonia acutangula* Gaert., *Lecythidaceae*), a light-coloured wood with large pores and marked medullary rays.

For the carving of figures, a light brown wood of an even structure, generally called *country wood* or also *nōna maram* is used. Its botanical classing is a type of *Morinda* of the *Rubiaceae* family.

Palaniappan calls ebony (*Diospyros ebenum* Koenig, Fam. *Ebenaceae*) *ebony* or *karukali* but he seldom uses it.

Small, pointed pegs used for securing glued parts *(muṅgiloni)* are produced out of bamboo *(muṅgi* or *bamboo)* (02/23, cf. Fig. 70 on p. 118; 02/24, cf. Fig. 71 on p. 118; 08/30, cf. Fig. 78 on p. 129).

Synthetics

Mastercraftsman Palaniappan works several types of synthetics in his workshop and these form a substitute for or an alternative to organic materials.

Pure white PVC is used for inlays in the soundboard and body shell (03/25, cf. Fig. 105 on p. 182). In this function, it replaces *sambar horn* which used to be used. The material, which is about 1mm. thick, comes in large bales. Dragons' teeth (cf. Fig. 79 on p. 131) and other decorative elements are produced from thicker PVC. Occasionally, cream-coloured or ash-grey qualities are found in use.

Palaniappan has used plexiglass for many years to make nuts for tambūrā instruments. The transparent, colourless material is filed matt with sandpaper and under the influence of light and high air temperatures, it yellows relatively quickly to a colour similar to horn so that it acquires a compacter appearance. As regards stability and the transmission of vibrations, plexiglass performs very like deer bones or horn, which were used in earlier days, without possessing their high specific mass.

Palaniappan also uses prefabricated parts made of synthetic materials for building vīṇā and tambūrā; these are produced by a specialised firm in Bangalore. These are on the one hand body shells which are used for simple instruments (03/33, cf. Colour Plate XVa; 03/32, cf. Colour Plate XVb). They are yellowish on the outside, in order to imitate the colour of fresh *jackwood* and also have the raised stripe pattern which is otherwise worked into the wood. On the other hand, there are neck resonators made of synthetics (16/02, cf. Colour Plate Ia), which are used as a lasting alternative to the traditional resonators made of papier mâché or calabashes. The neck resonators are medium brown on the outside but they are nearer in shape to the metal resonators which were fashionable about ten years ago. Both prefabricated products have a common construction. The outer shape-forming layer consists in each case of a coloured or lacquered, thermoplastic synthetic substance. On the inside of this inherently soft form, several layers of artificial resin fortified with glass fibre are applied, ensuring its actual stability and giving the substance its name: fibreglass.

Metal

In Palaniappan's workshop, metal finds its use in the construction of stringed instruments. It comes half-finished for completion or is fully commissioned. Prefabricated products are either integrated in the production process or they are fastened on to the instrument in the final phases as replaceable items.

Bronze: By far the most important metal in the production of vīṇā instruments is an alloy which Palaniappan calls *bell metal, vengalam* or *bronze.* He uses it to make his frets, coverings for the bridge and the nuts, and tailpieces and resonator holders. M. Palaniappan has these objects (10/19) made according to specimens or wooden models at a foundry on the northern edge of the old town. The finishing of this extremely hard material which is so resistant to wear is carried out with the use of files, sandpaper and polish in the vīṇā workshop.

Brass *(pitalai)* is much softer and used only for certain attachments such as the rim on soundholes and for hinges. The visible surfaces are highly polished.

The side nuts *(tālam biggedī)* of the drone strings and the tuning beads on tambūrā instruments are made of aluminium. All aluminium parts are made with the help of a lathe by a neighbouring mechanic. Palaniappan had also had particularly high precision pegs made in this manner (12/16, cf. Fig. 80 on p. 134).

Factory-made products of iron – chiefly nails, screws and small hinges – are used to join various parts made of wood, plastic or other materials either permanently or provisionally.

Steel is extremely important as the material used for the strings which are primarily responsible for the sound produced. Palaniappan uses blank steel strings from 0.30mm

to 0.45mm in diameter. He gets this rust-resistant wire from Madras in large rings weighing up to a kilogram.

Copper *(sempu)* is found – apart from its presence in alloys – only as covering wires on the bass strings. These have a diameter ranging from 0.64mm to 1.01mm. On a cylindrical base, they carry a cover winding consisting of one or more layers of copper wiring from 0.10mm to 0.20mm across. Strings which are ground are regarded as of a specially high quality as they reduce contact noise. Covered strings are bought ready made in single lengths in the music shop in Madras.

Glues

To join precisely fitted wooden parts to each other, Palaniappan prefers wood glue of the make *Fevicol* (02/19, cf. Colour Plate XIX), which is extremely widespread in Southern India. The brand name has become synonymous with the glue, the base of which is Polyvinylacetate (PVA).

For filling slits, knots and other blemishes in the wood, wood putty is used in vīṇā making. Fine plaster of paris (11/03) is mixed in approximately equal proportions with wood glue and, if the need arises, mixed with pigments. Wood putty of this sort can be used in all Palaniappan's applied techniques without damaging the tools (25/36).

In Mastercraftsman Palaniappan's workshop, contact glue of synthetic rubber (08/35) is used primarily for sticking PVC to wood. It is applied thinly to both parts, aired for a while and then pressed firmly together (09/00). It is not necessary to hold them under pressure for long.

Both glues discussed above are denoted by Palaniappian in Tamil as *vajirām.* This term also includes the hot glue used by him in earlier days and which was based on animal glutin. When in use, this glue must be kept at a constant temperature of between 60° C and 66° C. Apart from the bother of using it, Palaniappan does not like the glue because of its unpleasant smell.

A traditionally used thermoplastic putty (01/28, cf. Colour Plate XVI; 01/29, cf. Colour Plate XVII) produced from plants plays an indispensable role in vīṇā making right up to the present day. This substance known as *arek* (02/01, cf. Fig. 81 on p. 139) is a thick fluid (02/11) and sticky only while hot, but on cooling is immediately hard and brittle. Its consistency makes it particularly suitable for filling gaps (02/06, cf. Colour Plate XVIII) and fitting parts exactly.

For lacquer, M. Palaniappan uses shellac exclusively. He buys a ready made product which contains a solvent of alcohol. The substance is called *french polish* or simply *polish* (04/01, cf. Fig. 57 on p. 95). The lacquer is applied in layers with the cotton pad, in inaccessible places using the paintbrush.

Palaniappan uses beeswax *(tēn melegū)* for priming sanded wood and for lubricating metal tools and screws. The thermoplastic wax mixture, which forms the fundament for the row of frets *mēlam,* contains beeswax and stearin *(white melegū)* and a yellowish-white powder called *kunkīlyam* which we were unable to analyse more closely. Washing blue is added as dye *nilam* (18/22, cf. Colour Plate XIa).

In the old days, M. Palaniappian used horn for various constructional and decorative elements on the instruments, by preference the antlers of the sambar stag, lat. *Cervus unicolor* (13/16, cf. Fig. 82 on p. 142). The antler horn is known as *mān komp* or *kadampei*, although the name *sambar horn* is more common these days.

E. Tools and Procedures

Measuring, Scoring, Slitting

In making vīṇās, the basis for any construction activity is measuring and marking (25/22, cf. Fig 84 on p. 144). A textile measuring tape, 60 inches long, plays an extremely impor-

tant part in M. Palaniappan's workshop, as all larger measuring tasks are carried out with this tape (18/12, cf. Colour Plate XXIIa). A straight edge *(varvu sattam)* (06/25, cf. Fig. 31 on p. 65) made of plywood, about 1m long, is used for marking straight lines and for checking corners and surfaces. The straight edge of any tool can be used as a ruler for shorter lengths, additionally a flexible steel ruler (25/10), 20 inches in length, also exists, which can be used on curved surfaces. An iron angle (*mulai mattam* or *trysquare*) (25/10; 11/11, cf. Fig. 39 on p. 75) serves for drawing and checking right angles.

The lines to be marked are drawn with a pencil or etched with the corner of a chisel. For markings parallel to the edge, the home-made scribing gauge *kitekatai* is used (25/10). For arcs, various compasses are used (25/06, cf. Fig. 86 on p. 150), which are called *kavarayam* or *kompas*. The latter two tools can be used to score through hard, homogenous materials such as horn or plastic to the point where they can be broken apart cleanly (02/31, cf. Fig. 120 on p. 209).

Sawing

For sawing wood, either the hand saw *rambom* (25/21, cf. Fig. 87 on p. 153) or the backsaw *mattai potaval* is used. Both tools are sharpened with a triangular section file. Uses are – 1. Sawing (11/15, cf. Fig. 41 on p. 76) and dividing across the grain. 2. Longer cuts parallel to the grain. 3. Grating out and shaping narrow grooves primarily when producing patterns and decorations on the wood.

Metal is sawn with purchased metal sawblades (hacksaw blade) which are either clamped in a saw bow (hacksaw frame) (25/21, cf. Fig. 87 on p. 153) or which are used with a cloth wrapped around them as a handle. A small puck saw is also used for lighter tasks.

Horn is sawn in M. Palaniappan's workshop by two people (13/16, cf. Fig. 82 on p. 142), sitting opposite one another, with the aid of a special frame saw (cf. Fig. 88a, b on p. 155) , which is notable for its blade set at right angles to the frame (the English name is log saw).

Carving

In the construction of Southern Indian stringed instruments, the most important shaping tasks are carried out by splintering the wood with the aid of one-edged tools driven by hand and muscle power.

The chisel *(vulli)* with its straight blade comes in different dimensions. The most popular variant is the 1 3/4 inch broad standard model (25/11, cf. Fig. 89 on p. 157) which is used as much for rough as for fine tasks. It is cut to one edge and is used for splitting (25/19, cf. Fig. 96 on p. 165) as well as for shaving. During carving, the chisel is held with the left hand by the handle, positioned on the material and guided as it is pushed forward (06/08, cf. Fig. 30 on p. 64).

The gouge *(madel vulli)* is indispensable in the production of thin-walled, curved instrument parts. The heavy work of hollowing is done with a straight gouge (01/07, cf. Fig. 91 on p. 159) which is 1– 1 1/2 inches wide. Cropped chisels with curved shafts (25/23, cf. Fig. 92 on p. 160) are kept at hand for work inside the body shell.

They are made or altered by the vīṇā makers themselves (25/25, cf. Fig. 93 on p. 162). During work on the body of the instrument, a weight (07/22, cf. Fig. 34 on p. 68) is positioned against the shell and the vīṇā maker works among other methods by ear.

The handles of the carving irons are made out of wood and strengthened at both ends with metal. They are interchangeable and are attached to the tools that are in use at the time.

Driving the large chisels is done almost exclusively by striking the handle-end (cf. Fig. 95 on p. 164). The wood can be split along the grain with the supplied energy. A cylindrical piece of iron (*mallu* or *hammer*) (25/18, cf. Fig. 90 on p. 158; 05/21), wooden mallets *(kotapuli)* (09/16) in various sizes or just the hand can be used for striking (15/27; 05/17).

Carving involves use of the whole body. Larger objects are held between the legs or clamped against the wall. The feet and toes help out on smaller pieces of work. The working position is often changed and the position of the body adapted accordingly. For heavier tasks, the left arm which is guiding the iron is often supported by a leg.

Steel blades (09/0) are used for the precise carving of grooves. They are made from old saw blades.

Small handle-less carving irons (25/11, cf. Fig. 89 on p. 157) are required for fine carving tasks and for cleaning and marking. They consist of relatively soft strip iron and are easy to sharpen and to forge. They come with straight blades or as gouges and are driven by a mallet (13/11, s. Colour Plate VIII) or just with the pressure of a hand.

Planing

Planing is the working of surfaces in a shaving action with a blade, which is fixed in a frame and guided along the work-piece at a pre-set angle. The aim is an even treatment of flat or curved surfaces.

Various planes are found in the workshop, some of which are used for very specific purposes. In a kind of modular system, most blades can be used in several different planes. The standard type (25/04, cf. Fig. 97 on p. 168) for use on flat surfaces is the prefabricated metal plane *(ilāpali)*. Inside, a 1 inch wide blade is held by a plexiglass wedge (16/27). The following blades are listed in order of use from coarse to finer tasks: the rounded fleecing blade for the rapid removal of material, the coarse toothed blade and fine toothed blade for jobs against the grain and for an uneven grain, as well as the straight blade for fine work and for finishing off.

Planing is carried out on the floor (09/27); shorter pieces can be laid on a special board (cf. Fig. 98 on p. 171) which has metal tips attached to its ends, which function as bench hooks.

Home-made wooden compass planes (25/05) are used for working over the body shell. A plane with a convex sole (07/11, cf. Fig. 99 on p. 173) and a rounded blade is used for work inside. Another plane with a concave sole is applied to the outside of the instrument using toothed or untoothed blades. A thin rabbet plane (13/05, cf. Fig. 44 on p. 79) also fitted with a concave brass-covered sole is indispensible for shaping the profiled striped pattern on the body shell. The fret ledges are formed (15/21; 15/16) with the aid of two profile planes (25/03) with right-angled *(matta kudu)* and acute-angled *(mono kudu)* iron blades.

Rasping and Filing

For many coarse tasks, Palaniappan prefers the 10 inch halfround rasp *mūlaram* (11/08, cf. Fig. 38 on p. 74), which he mostly uses without a handle. A smaller round rasp *(vurundai mūlaram)* serves to shape narrower radiuses.

One special tool is called *pitteravi* (cf. Fig. 100 on p. 175; 13/11)) or also *terenai koḍū taggede* or in English the *veena makers file*. It consists of a wide iron with a handle, which is filed into teeth by the vīṇā maker himself. The tool's function (13/07, cf. Fig. 45 on p. 79) is somewhere between that of a plane and that of a saw. The work-rate and the shaving ability of this tool are impressive while the quality of the surface achieved is extremely smooth.

The most important type of file is the 10 inch file (25/07, cf. Fig. 101 on p. 176), which is a flat file *(patat aram)*. It can be acquired cheaply anywhere and is used on metal (03/16, cf. Fig. 102 on p. 177) and wood. The somewhat smaller halfround file is called *arai vata aram* or *'halfround'* for short (25/26, cf. Fig. 85 on p. 147). It is used for all deep concave forms, grooves and decorations. A further large and small round file *(vurundai file)* exist, both of which are used for making peg channels (16/28, cf. Fig. 103 on p. 179). A small triangular section file has a fine cut and serves to sharpen tools.

Sanding

Sandpaper (03/36, cf. Fig. 104 on p. 180) for sanding wooden surfaces is acquired in sheets from tool shops and termed *portesalai*. A light-brown abrasive whose main element is strong paper is used in two different grains. The coarser paper has a grain which corresponds to a classification of 80 to 100 and is called 'rough' (17/22, cf. Fig. 53 on p. 90). The finer paper is termed 'nice' and has a grain of 150 to 180.

Sanding fabric, which has a stiff textile surface and is sprinkled with black carborundum particles, is used for the final sanding of metal surfaces (19/30, cf. Colour Plate XIVb). The binder is a colourless glue, non-soluable in water. Sanding fabric is also purchased in sheets and Palaniappan uses it with a very coarse grain of 100 to 120.

Stripping and splintering to clean or smooth surfaces is done with blades or with small carving irons.

Sharpening tools is a special sanding process:

The sharpening board *thēṭṭu palaka* (09/21) consists of semi hardwood with a homogenous macrostructure which is noticeably light in colour in places where the wood has splintered. The work surface is curved transversely and is visibly hollowed out in the middle with use. The abrasive is called *pōdi* or *vellaikal* and consists of hacked white quartz. The sharpening board is laid flat and secured firmly to the floor for sharpening. A quantity of quartz is strewn on to the board and then spread out by hand. The tool is guided rapidly with strong pressure lengthwise over the board. The vigorous movement of the iron over the scattered quartz crushes the individual grains and prepares them for use in the rough initial sanding process.When carried out correctly, sparks fly during this part of the operation. The pulverised quartz is then pressed into the pores of the wood and its fine sanding qualities come into effect. After quite a few movements, the practitioner stops to examine the sanded surfaces as well as the edge. If the latter is still blunt or nicked, more fresh quartz is spread on to the board and the process is repeated.

Pre-sharpening is necessary when the iron is very blunt or broken or when the shape of the iron needs to be altered. This is done outside the workshop on the concrete floor of the veranda. When carried out correctly, sparks often fly and in a short time the iron is moulded into the desired state.

Lacquering

Palaniappan lacquers his instruments with shellac in a process, whereby many thin sheets of lacquer are layered one on top of the other. Palaniappan terms this technique, which requires few tools but a lot of specialist knowledge and experience, '*polishing*'. Liquid beeswax is used as a base coat and is applied with a brush.

Clean cotton cloths are used for cleaning and for soaking up excess wax. The shellac is dissolved in alcohol (04/01, cf. Fig. 57 on p. 95), poured into a bowl and applied with a pad of fine fluffless cotton material with rapid movements on the surface parallel to the grain. The instrument rests on a clean paper sheet (16/23), used as an underlay. Good light and strong nerves are also essential for the success of this work as this lacquering technique (12/15, cf. Fig. 109 on p. 192) does not allow for any mistakes.

Turning

Turning is a mechanised form of cutting work, in which the piece is carved in a rotating motion. This technique is used chiefly on wood and horn. There is an old turning machine called the 'carrousel' in Palaniappan's workshop (13/23, cf. Fig. 94 on p. 163). The work-piece is clamped between two tips found on this adaptable frame. The mechanism is started with a pulling cord, manned by a second person. The turning equipment (12/02, cf. Colour Plate XXIIIb) uses blades and carving irons for shaving, sandpaper for sanding and wax for polishing (12/00, cf. Fig. 107 on p. 190).

Other Tools

To make holes in materials like wood and plastic, M. Palaniappan uses two bow drills, which can be fitted with various insets (25/15, cf. Fig. 113 on p. 196). They are called *tamūr kūde* or simply *tamūr*. They are both started with a cord (11/31, cf. Colour Plate XXIV; 25/16), which is knotted tightly at both ends of a stick – this apparatus is named *villekali*. M. Palaniappan's cord stick can be divided with the aid of aluminium casing when a second person takes over the job of driving the tools for difficult drilling tasks (05/15; 18/04).

The reamer *nāl pattai piṛdai* is a special self-made tool (25/17), created from four-edged steel which is slightly tapered and whose edges are formed into a row of teeth. This tool's only use is the precise shaping of the peg channels (10/29).

A soldering iron is used solely for melting and distributing the thermoplastic coloured cement (12/28, cf. Colour Plate XXI), which fills the engraved pattern on the rim of the instrument. It has a wooden handle and 40 watts of power.

The coal scuttle (17/34) is used to heat tools, work-pieces and materials. This vessel is filled with charcoal as required from the kitchen oven and carried into the workshop.

Air can be supplied in doses using palm-leaf fans.

A big vice (*vise* or *pudici ravi*) (25/31, cf. Fig. 115 on p. 201) is secured to a low, stable bench and used in the workshop to clamp small objects which need to be filed or planed as well as for carving vīṇā soundboards (cf. Fig. 19 on p. 52), which are held vertically during the shaping of their curved surfaces.

F. The Construction Process

Using the full documentation of the construction of an instrument, the building method and construction principles of the *ekāṇḍa vīṇā* or *onno vīṇā* are demonstrated. In this construction method, the body shell, the neck and the pegbox are carved in a monoxyl fashion, i.e. in one piece from a block of wood. The following section describes M. Palaniappan's working method and serves as an example of the construction from the design of a new model to its completion.

Preparations

During a conversation in the workshop, the idea was born to build a vīṇā of reduced dimensions without any loss of sound quality. Palaniappan designed on a scale of 1:1 on a piece of plywood. He gave the project the working title 'cinna vīṇā' (the small vīṇā).

The next day a big block of *red cedar* was chosen as material and taken to a sawmill to be cut to size. There the sawmaster, a close friend, cut the rough outline of the body of the instrument from the block of wood (04/33, cf. Fig. 28 on p. 61).

Carving

Back in the workshop, M. Palanaiappan first inspected the vīṇā rough-cut (05/02, cf. Fig. 29 on p. 62) before drawing the design directly on to the wood with a compass and a ruler. The excess wood was removed along the marked lines with a chisel and then the vault of the body shell was carved out (05/32, cf. Colour Plate III). The plane of the neck was constructed 06/08, cf. Fig. 30 on p. 64) at a slight angle to the body and the neck rounded at the back. The shape of the outside was smoothed with a rasp and a concave plane (05/11, cf. Colour Plate IVa).

The next task was the hollowing-out of the body shell with various gouges. First, hardy tools were applied with great strength (06/35, cf. Colour Plate Va); later, gouges were used with more care (07/16, cf. Colour Plate Vb). The neck was hollowed out from the inside in a similar fashion (07/22, cf. Fig. 34 on p. 68), then both hollows were filled with water (07/33) and put to one side for a day and a half.

After the removal of the water, the pegbox of the instrument (09/02; 09/03; cf. Fig. 35 on p. 69) was shaped from the inside (09/11) and outside and then the two lids to be attached were fitted (07/01, cf. Fig. 32 on p. 66). Now and then, the symmetry of the instrument was checked with a compass and cord and the outside of the neck was planed into shape. The wall of the wet rough-cut was further reduced on the inside with a special heavily cropped gouge until it only had the thickness of a finger. Father and son took turns in carrying out this task. They progressed extremely carefully each time, laying a padded weight against the instrument from the outside (09/24, cf. Colour Plate VI; 09/26).

The outline of the soundboard and the neck-cover were sawn in one generous piece out of a board (07/37) and trimmed along the marked lines with a chisel. On the outside, the soundboard was given a gentle convex curve (09/27) and the inside a concave curve. Palaniappan left a strip of wood running across the soundboard and demonstrated its acoustic effectiveness with the aid of a tuning fork (09/34, cf. Fig. 37 on p. 72).

The body shell and soundboard unit were matched up and fitted together with wood glue. Holes were bored along the rim with a bow drill into which wooden nails dipped in glue were hammered. To provide additional pressure, the instrument was bound together with ample thick cord.

The Form of the Exterior and Surface

After it had been left to dry overnight and the binding had been removed, the excess wood at the instrument edges was rasped away (11/08, cf. Fig. 38 on p. 74) and the entire exterior worked over with a plane. The symmetrical axis of the neck was calculated and extended over the soundboard. Using two arcs as a starting-point, the outline of the soundboard was designed and constructed in a lengthwise slightly oval form and the rim of the body was reshaped accordingly.

The mythical animal head *yāli* was designed on paper (11/14, cf. Fig. 40 on p. 76) by the young craftsman, Kituli, a specialist in inlays and carving, and created from a separate *red cedar* block (11/13, cf. Colour Plate VII), presoaked in water, with a hand saw (11/15, cf. Fig. 41 on p. 76) and a chisel (12/31, cf. Fig. 42 on p. 77). On the back of the body shell, 23 regular stripes were designed (03/02) and marked, which he then shaped into a curve using a backsaw (13/03, cf. Fig. 43 on p. 78), a convex rabbet plane (13/05, cf. Fig. 44 on p. 79; 13/09) and a sawing rasp *pitteravi* (13/07, cf. Fig. 45 on p. 79). Without making any markings beforehand, he carved a symmetrical pattern, representing the curls of the *yāli*, on the neck-end (13/11, cf. Colour Plate VIII; 13/13). Palaniappan worked the whole surface of the instrument over including the decorated area with fine tools, formed the pegbox opening and then passed on the *cinna vīṇā* for sanding with sandpaper.

Engraving

The specialist, Sundaraj, decorated the edges, the soundboard and the back with floral patterns, which he engraved directly into the wood. Palaniappan terms this style of decoration which does without inlay markings and colourings, 'plain'. The work began with a centrally placed petal pattern on the lower end of the body, which Sundaraj developed out of a tiny circle. Then the edges to be decorated were sectioned off using a scribing gauge. Sundaraj designed one sequence of the pattern again directly on to the instrument with a pencil (16/06) and marked sections continuously along the instrument with a compass. Further parts were engraved free-hand (16/07; 16/19, cf. Fig. 47 on p. 83) and thus the pattern developed and became more condensed during the work process (16/26), previous sequences being elaborated where appropriate. Pencil tracings of individual motifs were made and shown to Palaniappan, who was working on other tasks. After looking briefly, the mastercraftsman marked several flourishes with a pencil, which were then transferred by Sundaraj to all sequences of the pattern. Both the circular-shaped

soundboard patterns were decorated in perfect symmetry, each with an *ānnam* bird (cf. Fig. 48 on p. 85; 16/33, cf. Fig. 49 on p. 86), which usually appears iconographically as the companion of the god, Palani, who has a connection with the name Palaniappan. A monogram in the area of the tailpiece and an inscription of the date hidden by its frame completed the engraving work (17/08, cf. Fig. 50 on p. 86; 16/34; 16/35).

Planks

Differing from the method used in Thanjavur, the fret ledges named *gādi sakai* or *planks* (cf. Fig. 22 on p. 54) are made separately by Mastercraftsman Palaniappan and then secured to the neck-cover. The support strips for the *cinna vīṇā* were sawn out of board, planed to size and then given a curved profile at the side (cf. Fig. 51 on p. 88; 15/20; 15/21) and a V-shaped profile at the front using profile planes. Glue was applied to the finished planks (17/14), which were then fixed symmetrically to the neck lid with several nails (17/17, cf. Fig. 52 on p. 89).

Pegs

The position of the pegs was determined geometrically by dividing the neck into sections and copying the measurements on to both sides of the neck (17/25; 17/26). The channels are made with a bow drill (17/30; 17/31), evened with a reamer and structured by pressing in a big round file. The peg shafts were planed to size (18/21) and then filed and sanded. String-holes were then drilled into the provisionally fitted pegs and the final length markings were made, to which the pegs were later sawn (18/25). Palaniappan applied chalk to the shafts to increase the friction.

Lacquering

The *cinna vīṇā* was not primed with wax, but with shellac. Palaniappan applied this lacquering solution (18/26, cf. Fig. 56 on p. 94) under measured pressure in calm movements and relatively thickly, as the untreated wood soaked up a lot of the liquid. The process just described is inkeeping with the *plain style* of decorating the instrument. The structure and colour of the wood itself should come to effect; a high shine polish is superfluous here.

The following day, after the prime coat had dried, the lacquering process was continued. This time M. Palaniappan was polishing with rapid, even movements (18/27). The pads were only dipped in lightly each time, so that they did not absorb too much shellac. In this way, three or more layers were applied (04/15, cf. Colour Plate IX; 04/11), one immediately after the other, then the instrument was hung up again to dry.

Montage

An iron support bolt was inserted into the neck and the bronze resonator support attached, to which a wooden trestle *(stand)* was provisionally fixed. The soundhole was first drilled and then filed more precisely with a half round file, then the brass soundhole ring was attached without using glue. The upper terminations of the drone strings, made of *sambar horn*, were made to fit by Palaniappan, who soaked them in glue and pressed them into the appropriate holes. The teeth of the *yāli* (18/30) were filed from the same material and then glued and adjusted into the upper jaw. Glue was applied sparingly to the dragon head itself, which was then screwed to the end of the neck (18/31, cf. Colour Plate X). The pegbox lid was attached using a hinge and given a horn clasp (18/33).

The nut and the bridge were covered with bronze plates and fitted, the bridge (18/01, cf. Fig. 58 on p. 97) was fixed to the soundboard in its premarked position.

The tailpiece (18/34) is fitted with fine tuners and screwed on to the lower end of the body. As a test, the four melody strings were tightened (18/35, cf. Fig 59 on p. 99; 18/36, cf. Fig. 60 on p. 100).

Mēlam (the Row of Frets)

Beeswax was heated with colouring, stearin and additional ingredients (18/22; cf. Colour Plate XIa) and stirred to a black mixture. The mass was poured out (12/35, cf. Fig. 110 on p. 193), kneaded and moulded on to the fret supports (19/12; cf. Colour Plate XII; 19/11, cf. Colour Plate XIb), into which 12 broad steel nails (18/17, cf. Fig. 124 on p. 224) had been hammered for better anchoring. After an hour, the wax layer could be shaped to a right-angled profile with a chisel (19/18, cf. Colour Plate XIIIa; 19/17; 19/22). Then the strings were reattached and the form of the bridge-plate was adjusted with a blade and file until Palaniappan was satisfied with the sound.

The vīṇā maker, G. Venkatesan, a close friend, came to set the frets. He tuned the melody strings consonantly by ear and the three drone strings very precisely to a fifth and an octave from the melody string *sāraṇī*. He took each fret individually, established its correct place under the strings by ear, and then pressed it with combination pliers into the wax support strip. Further controlled pressure was applied using a notched handle (19/34, cf. Fig. 64 on p. 106; 20/00, cf. Fig. 65 on p. 107). The sound was checked and the fret adjusted where necessary. Venkatesan used the combined sound of the three drone strings as a point of reference. He began with the consonant intervals of the first octave, then filled these with all their notes and fretted the second octave (20/0, cf. Fig. 66 on p. 108). He then checked individual positions by fingering two-noted chords on the second highest string (20/01, cf. Fig. 67 on p. 110). Occasionally, frets that still jutted out were pressed deeper into the wax bed. G. Venkatesan completed the tuning of the *cinna vīṇā* with a playing test (CD: Klangbeispiel 2).

The final work on the row of frets was carried out by Palaniappan three days later. He sealed the wax round the frets using the burnisher *vurundai katti* (25/14, cf. Fig. 83 on p. 143) and smoothed the outsides of the wax strips with hot files (20/05). Then he cut the wax out between the frets in a curved shape with a sharp knife (20/11, cf. Fig. 68 on p. 112; 20/12; 20/15). Finally he smoothed (20/13; 20/14), cleaned and polished (14/32, cf. Fig. 112 on p. 195) the whole *mēlam*.

Resonator

Palaniappan had decided to equip the *cinna vīṇā* with a traditional neck resonator made of colourfully decorated papier mâché. He made a small eight-sided reinforcement block, drilled through the resonator at its vertex and screwed it to the support with a wing-nut (20/16). Mastercraftsman Palaniappan tuned the instrument, tested it by playing sitting down, demonstrating thereby how easily the individual positions on the neck could be reached. Then he stood up with the instrument and demonstrated that its light weight made other playing positions possible: diagonally across the front of the body with the resonator on the shoulder "like a rock musician" (20/19), or vertically "as in a temple" (20/20).

G. Instrument and Sound

Sound is one of the important criteria for judging musical instruments. The art of instrument making depends to a large extent on the craftsman's ability to take the visual aesthetics and the static factors into account, while producing an instrument with the desirable sound.

Mastercraftsman Palaniappan's Theories on Sound

M. Palaniappan uses the expressions *'sound'* and *'vibration'* positively. A good instrument must be equipped with both. The 'vibration' comes from the strings and is passed to the soundboard *(mēlpalakai)* by means of the bridge. The material, quality and construction (cf. Fig. 76 on p. 127) determine the sound, which is why such care needs to be

taken here. The grain of the soundboard wood should be aligned with the long axis of the instrument, it should be straight *(nēr)* and parallel, so that it does not provide any resistance to the vibrations. The freedom of the vibrations is also ensured through the circular layout of the finely drilled holes, integrated into the soundboard pattern.

The hollow space inside is important so that the instruments's voice may resound freely. Particularly the transition from the body of the instrument to the hollow neck should not be restricted in any way. A soundhole in the soundboard can help the sound to travel. The bridge *(kuḍerai)* must be strong and stand firmly with both feet in the soundboard. The bridge-plate should be cast from hard, high quality bronze free of air bubbles, and have a regular, convex surface. It must be stable and secured with wood putty *(arek)*, leaving no hollow spaces. Palaniappan fits the side bridge *(tālam rēk)* into a socket in the elongated left foot of the bridge. For tambūrā instruments the entire bridges are made of the hardest possible wood and fastened with screws on to the soundboard. A vīṇā without its resonator *svarakai* mounted back to front at the top of the neck is technically and aesthetically incomplete, yet Palaniappan never said anything regarding its influence on the sound of the instrument. He prefers resonators made of plastic reinforced with fibreglass because they are robust.

Sound plays a major role in the manufacture of the instruments: During carving work on the wooden parts, the strength of the remaining material is tested by snapping a thumb nail against them. The resulting frequency spectrum tells the vīṇā maker whether or not he has to continue carving. Of particular significance is the procedure on parts which, due to their size, can be touch-tested between thumb and index finger only at their edges, namely soundboard and body shell. These are also "knocked" with the flexible chisel during their hollowing out.

Acoustics

A comparison between a western, "scientific" view and the reflected empirical knowledge of M. Palaniappan, the vīṇā maker rooted in the culture of Southern India, shows the equal value of both. The same results are often reached in different ways:

In the case of the vīṇā and tambūrā, long diapasons, the relatively small diameter of the strings and the covering of the low strings have an advantageous effect on the purity and the richness of the higher tones of the sound spectrum. The bridge-plate (cf. Fig. 63 on p. 104), made of hard bell metal, influences the vibration of the strings (19/28, cf. Colour Plate XIIIb). Its slightly convex form (19/29, cf. Colour Plate XIVa) has the following effects: an enrichment of the range of partials; a more even distribution of frequences through the weakening of the spectral gaps which results from the existence of a fixed plucking point; the emergence of a formant with gradually sinking pitch; changed attack and response of the strings and the existence of beats (between neighbouring frequencies). The soundboard with its slight outward curve produces non-linear developments in the resonance, thus adding further partials to the sound. The resonance space and the soundhole colour the sound by emphasising certain frequencies.

It seems necessary to regard stringed instruments each as a discrete system. An acoustic investigation should take its manufacture into account as well as its use and playing technique.

H. Playing Technique

Playing Southern Indian vīṇā is an art which demands years of training. Complicated sequences of movements are learnt and carried out with precision to the millimeter while simultaneously having to be checked by ear. The players adapt their position and motor skills to the instrument and the technique of playing it. This has tangible physical results: the finger tips of the left index and middle fingers develop hard skin each with a deep

furrow in which the different strings are manipulated; the index and middle fingers of the right hand show somewhat scarred dents resulting from holding the wire plectra which practically fit in there.

The instrument and its playing technique have been adapted to each other in the course of its development over hundreds of years. Both are so closely linked these days that it is often impossible to say if a certain detail on the instrument is determined by characteristics of technique or vice versa. Playing the vīṇā, producing melodic-rhythmic sequences, determines actions which take place in three different dimensions:

1. The first dimension results from the carefully placed plucking and muting of strings which differ in pitch and function. This applies to melody strings as well as drone and punctuation strings *(mūpal)*. In short, the choice of strings.
2. The second dimension concerns the shortening of the strings on the frets to alter their pitch, i.e. the linear movement on the string.
3. The third dimension is attained through the lateral deflection of the strings on the frets to adjust their pitch fluidly, departing from the current note.

Together, these techniques produce a three-dimensional sound space which has its motion in time. Each note has a defined place in this space at any given time and this is determined by the way it is produced.

Certain elements of playing technique exert a particular influence on the construction of the instruments and place corresponding demands on their function:

The order of the strings from left to right descending in scale makes the plucking of the melody string *sāraṇī* easier as it is thus at the front from the player's point of view. The large distance between the strings benefits the various techniques of striking and muting. The tuning of the strings at alternating fourths and fifths avoids dissonant notes and allows for the use of the empty strings as drones; playing with 24 chromatic frets furthers musical thinking in modal structures.

At the front, the thick frets (03/16, cf. Fig. 102 on p. 172) have a rounded profile which enables the player to slide effortlessly over the string. The distance between the frets and the strings can be regulated. The exact positioning of the frets (14/17, cf. Fig. 125 on p. 226), with the aim of attaining a desired pitch, is influenced by the action of the strings, the material characteristic of the strings and by their regularity in terms of diameter and density. Compensating for these factors can make a difference of between several tenths of a millimeter and several millimeters.

The fingered notes are corrected automatically during playing by stronger or weaker pressure. Not only are the correctly perceived intervals on the scale learnt in the course of a vīṇā training, but also how to attain them on a given fret order. If one then acquires another instrument, one will inevitably perceive the *mēlam* as wrong and distorted.

A significant feature of vīṇā playing is the alteration of pitch by lateral deflection of the touched string on the fret. In this way glissandi, runs and decorations can by played very rapidly and precisely. The technique is ideal for the microtonal colouring of intervals. A basic condition for pulling the strings is a certain width of the row of frets. Both the strings which are used chiefly for melodic work are to be found on the left of the neck so that they can be pulled to the right over the frets. In order to make possible the necessary freedom of movement for this technique, the wax surface between the frets is cut out in a curve (14/28; 14/30).

If the frets are to be resistant to premature wear caused by the mechanical scraping of strings under tension, they should be made of a durable material. M. Palaniappan prefers the traditional bell bronze (14/33, cf. Fig. 111 on p. 194) and has a low opinion of brass.

In order to maintain the repeated, sudden heightening of tension caused by deflecting the strings, the pegs and the finetuners of the four strings must be so worked that they do not give. At the same time they should be easy to release for retuning. As the bridge (18/37, cf. Fig. 61 on p. 101) is pegged into the soundboard (cf. Fig. 62 on p. 102), it does not shift when the strings are tightened and its position can at any time be reconstructed exactly following the replacement of strings or repairs.

Posture

Nowadays it is usual to sit cross-legged on the floor, the left leg over the right. The vīṇā rests with the body shell on the floor and a cloth or flat cushion under it for protection. The neck resonator is supported on the left knee. The right, plucking hand is relaxed on the edge of the soundboard and steadies the instrument. The left arm reaches under the neck to the strings. In this playing position, practically all techniques carried out by the left hand can be achieved in the entire area of the 24 frets, which corresponds to two octaves, without touching the neck itself. The fingers approach the touched string in an arc, while all other strings remain free to vibrate. To sum up, one can say that a playing posture has been developed to allow the instrument to be well stabilised with a minimum of contact and thus for the dynamic playing technique in all three dimensions.

I. Conclusions and Perspectives

In Conclusion

In the course of the work under review a modern day, active culture was able to be investigated. In interpreting observed processes and facts, I have consciously decided against using a historical or imaginary reconstruction of circumstances before the study. It was rather my intention to document a small but significant part of Southern Indian musical life and to recreate its variety and vitality in a series of snapshots.

Due to the friendly openness of M. Palaniappan and his family and the willingness of them all to satisfy my hunger for knowledge, the research could take place under conditions close to the postulates of classical *social anthropology*[8]. For three months I lived with my master under one roof and was cared for as part of the household. In this time, Palaniappan shared almost all meals with me, his whole workshop and the sleeping area. The fact that he accepted me pro forma as his disciple enabled him to pass on his knowledge without reserve. As a result of this generosity, I left Southern India enriched as a person, laden with tangible and intangible treasures.

During my time in the workshop of the vīṇā maker, M. Palaniappan, I was able to observe the production of several instruments from start to finish and document the master's work in over one thousand photographs. One instrument, the *cinna vīṇā,* was made especially for the purposes of my apprenticeship and presented to me to take back to Europe. It can be found today under the custodianship of the Department of Ethnomusicology of the Berlin *Museum für Völkerkunde*[9], together with the sound documentation and the originals of the photographs. The most important films were developed in India straight away and prints of the negatives made in order to enable the participants to check my work. They never lost their calm or allowed themselved to be distracted, even by the flashlight I used occasionally. With hindsight I feel profoundly grateful for being so accepted with all my idiosyncrasies and scientific eccentricity.

Results

To finish off, I should like to bring together some of the most significant results in an overview and also risk making a prognosis for the future of craft.

1. New Materials are tried out, tested under realistic conditions and used if appropriate. If they are to have a serious chance of being adopted, they must be cheaper to

8 Lienhardt 1964:30.
9 With the object number Vll c 762.

buy, prove to have the same or better utility and allow for the same or similar working processes. The adoption of a new material happens gradually; never is a traditional material replaced by another from one day to the next. The economic pressure to produce goods while prices for materials and work rise continually is one of the motives for innovations in the use of materials. Apart from this, Palaniappan is ambitious to build instruments which are improved in sound and to develop surprising new solutions for details.

2. The external form of the instruments appears to be fundamentally constant. Consumers buy in such a way as to maintain tradition and this regards primarily the shape and appearance of the instruments. Particularly the vīṇā with their symbolic importance do not sell well if they vary radically in form. Changes in vīṇās have been made therefore in comparatively inconspicuous areas, such as the bridge, tailpiece and the frets *mēlam*. Well-known musicians have often undertaken more daring innovations (cf. Fig. 55 on p. 92) which then won acceptance by a broader group of consumers. The production of the drone instrument, tambūrā, has in contrast been experimental for some time. Strong curves in the soundboard (03/14, s. Fig. 72 on p. 120) have been adopted from North India along with variations in the shape of the body shell (cf. Fig. 73a, b on p. 123) and in instrument size (cf. Fig. 75 on p. 124). The number of strings and the construction of the bridge have also been altered.
3. The realisation of the traditional shape of the instruments while corresponding to the demands of modern musicians is the task of the instrument builder. A *veena maker* like Palaniappan resembles in parts of his activities more a manager than a dreamy, arty craftsman who makes everything himself. The master chooses the materials to be used and organises their delivery. He determines the partners to cooperate with and those workers who are engaged for certain tasks. He establishes and maintains contact to suppliers and customers. In case of uncertainty, his judgement is required. The most difficult jobs and work which is vital for the successful completion of the instruments he carries out himself. A good mastercraftsman is competent to judge what is good about old and new solutions and is able to convince his customers about possible new ideas. Mastercraftsman Palaniappan organises the craft carried out in his firm according to his ideas which were formed during the apprenticeships to his own masters and through experience in a long professional life.[10]
4. The vīṇā maker M. Palaniappan possesses comprehensive knowledge in areas which we, from our western, isolationist vantage point, would term musical acoustics, the science of oscillation, statics, woodwork, materials, sculpture and product design. His basic attitude to the material world is a critical rationality. He rejects the mystification linked with musical instruments and sound which abound in our culture and also in India and he believes only what he has experienced or tried out himself. M. Palaniappan knows exactly what he is doing in every detail of his work.[11]
5. Every researcher schooled in the customs of modern, western musical instrument construction should beware of generalising these principles and drawing premature conclusions about working methods which are "foreign" to him.[12] At any rate, I have had to confirm that procedures which I felt at first were daring or even contrary to the material in hand, proved on closer observation of the working process and on consideration of the local conditions to be soundly justified on a rational, physical level. For future investigations into traditional craft, one can safely assume that all elements, construction details and techniques make sense in the framework of the given reality. The search for this sense can be a guide to a deeper understanding of a culture of craft in its totality.

10 Some of the thoughts in these first three paragraphs were part of a lecture I held in 1994 at a conference of the ICTM in Nürnberg: Beyer 1995:99–101.
11 Cf. Feyerabend 1980:260.
12 Moser-Schmitt 1992:77.

6. In Southern India there is a continuity of production in stringed instruments spanning several generations. The transmission of knowledge takes place from master to apprentice. A considerable amount of knowledge and skill is passed on orally. *Veena maker* M. Palaniappan is part of this tradition (cf. section 1; above; cf. also Fig. 1 on p. 10) which his apprentice and son, Naterajan, will carry on. Naterajan's work proves he is a great craftsman capable of working with speed and precision and possessing all necessary knowledge. Furthermore, he has his own ideas and a vision for the future of vīṇā construction in accordance with the needs of musicians in a more sophisticated industrial society.

I see the future of the art of vīṇā building in a similarly optimistic fashion: Naturally this craft will continue to change but there exists a sufficiently large demand which can be influenced in such a way that Southern Indian instrument building will neither become shallow nor be threatened with extinction. If time and effort is invested, a situation can be achieved which should benefit manufacturers and players equally.

Interested parties outside India are also starting to realise that authentic, traditional musical instruments of quality are best acquired directly from the manufacturer. Demand from abroad heightens the reputation of the craftsmen and strengthens their determination to carry on even in the face of obstacles.

Observing and Understanding

Not only do apprentices in the most varied of cultures learn their traditional crafts through observing skilled craftsmen at work, but also outsiders, be they scientists or amateurs, are able to attain an aesthetic and intellectual understanding in this non-verbal way which would not be possible merely by studying the objects.[13] The cognitive theoretician, Paul Feyerabend, emphasises that as far as the mental grasp of a thing is concerned, it can be advantageous to know how it was manufactured.[14] The above investigation suggests that an understanding of musical instruments is decisively furthered by learning about their manufacture.[15] Particularly for museums of Ethnography, the presentation of typical construction procedures and the ideas of craftsmen may be helpful in conveying "foreign" music cultures.

In spite of the understanding I gained, I noticed an interesting effect on me during my time spent as an observer of the construction of musical instruments: To add to my admiration came astonishment at the finished product. Each time I saw a finished vīṇā standing complete and beautiful in M. Palaniappan's workshop, I could not believe that it was only made of ordinary materials and in the many single working steps I had documented so minutely. One explanation for these feelings might be that the archetypal shape of the instruments[16] realised to perfection means that the whole appears to be more than the sum of its parts. The difference could be called the aesthetic and spiritual surplus value. The most exact of observation leaves the secret of the created object nonetheless intact.

13 "Artisans and Archeologists: A Special Section on the Study of Crafts in India" (Anonymous introduction), in: *Expedition* Vol. 29, 3, 1987, p. 38.
14 Feyerabend 1977:39: "The creation of an *object* and the creation and the complete understanding of a *correct grasp* of the object *very often belong to one and the same indivisible process* which may not be separated without interrupting this process" (italics as in the original).
15 Cf. also Eichmann 1994:115, reporting on his experiences during the reconstruction of two coptic lutes: "At first, reconstructing the lutes was supposed merely to enable the confirmation of playing techniques and postures, as well as giving an impression of their range of sound. It soon became clear, however, that even the experiences made during the practical work are meaningful in the context of the evaluation of the formal instrument characteristics."
16 Eichmann, Päffgen & Beyer 1997, column 943.